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TABLES AND FIGURES

EXECUTIVE SUMMARY

In March of 2007 the Board of County Commissioners adopted a Strategic Plan for 2007 through 2011 that includes the following strategic goal:

> *By January 2009, adopt a comprehensive energy plan for Frederick County Government, which establishes definitive goals (annual) to reduce the County's use of non-renewable energy over a 15-year period in its office buildings, facilities and vehicle fleet by 50 percent or more.*

The Management Services Division was assigned the lead role for this strategic goal by the County Manager. The Division established three work groups to develop strategies to achieve the strategic goal focusing on the following sectors of County government energy consumption:

- Buildings
- Fleet
- Division of Utilities and Solid Waste (DUSWM) Facilities

Comprehensive Energy Plan Outcome

The recommendations in this Comprehensive Energy Plan include a combination of a) energy conservation, b) conversion to renewable fuel sources and c) generation of renewable energy. If all the recommendations in the Plan were implemented, the following reductions by energy source would be possible:

Energy Source	%-Reduction of Non-Renewable Energy
Electricity (kWh)	-100%
Natural Gas (therms)	-39%
Gasoline & Diesel fuel (gals)	-42%

This represents an overall 66% reduction in non-renewable energy consumption (after converting all units of energy into BTU's) which exceeds the 50% reduction target of the strategic goal.

Baseline Data

The work groups selected the following periods to determine baseline energy use:

Work Group	Baseline Period
Buildings	Calendar Year 2007
Fleet	Fiscal Year 2007
DUSWM	Fiscal Year 2008

Baseline periods vary due to the availability of data and the timing of the work groups' initial analysis. The use of different baseline periods is not material to the overall Comprehensive Energy Plan. The table below consists of each of the work group's baseline energy usage.

Comprehensive Energy Plan Baseline Energy Usage

	Electricity (kWh)	Natural Gas (therms)	Gasoline (gallons)	Diesel (gallons)	Heating Oil (gallons)
Buildings (CY 2007)	22,888,002	413,317			3,613
Fleet (FY 2007)			433,062	615,593	
DUSWM Facilities (FY 2008)	17,517,000	48,535			
Emergency Generators				7,658	
Deduct 1% generated from renewable sources	(404,050)				
Deduct 10% unleaded gals. for ethanol			(43,306)		
TOTAL BASELINE:	**40,000,952**	**461,852**	**389,756**	**623,251**	**3,613**
Conversion Factor to BTU	**3,412.14**	**100,000.00**	**124,884.38**	**138,874.16**	**138,874.16**
TOTAL BTU'S (millions):	**136,488**	**46,185**	**48,674**	**86,554**	**502**
COMBINED BTU'S (millions):					**318,403**

Future Growth as it Relates to Meeting the Reduction Goal

For purposes of this Plan, meeting the goal is measured against the total energy consumption of buildings, fleet and DUSWM facilities operating during the baseline period. It is understood that over time additional buildings, vehicles, water/wastewater and solid waste facilities will be brought on-line to meet the needs of a growing population. This Plan does not attempt to offset future energy requirements related to this growth. However, the waste-to-energy and landfill-gas-to-energy projects currently being developed by DUSWM have the potential to provide renewable electricity sufficient for this growth. We believe the best approach for this inevitable growth is to set the stage for all new facility and fleet expansions to be highly energy efficient, meeting at a minimum all the standards that are recommended in this report for energy reductions and renewable energy use.

Cumulative Effect of Recommendations

With many of the recommendations in this Plan the potential reduction in non-renewable energy use is expressed as a percent reduction of the baseline usage. We acknowledge that the cumulative effect of implementing the recommendations is less than the sum of the individual percentages. This is because each recommendation that is implemented effectively adjusts the base amount of non-renewable energy for subsequent

recommendations to impact. However, without knowing which recommendations will be authorized and in what sequence they will be implemented, it is impossible to calculate the cumulative percent reduction at this time except for the scenario where all recommendations are implemented.

Prioritization of Implementation

This Plan presents 31 recommendations that, if fully implemented, can take the County to its goal of reducing non-renewable energy use by 50% over 15 years. The County's Sustainability Commission suggests that implementation of specific recommendations be prioritized based on the following:

- Emphasize conservation ahead of conversion whenever possible as this maximizes the reduction of overall energy use
- Emphasize recommendations with shorter payback periods over those with longer paybacks or net increases in cost
- Focus on recommendations that have proven performance records rather than banking on future technology advancements

The Commission also recommends that implementation priorities be systematically reassessed to incorporate technology advances and changes in financial viability of recommendations.

Target Energy Reduction

Although the County Commissioner's Strategic Goal does not require that each segment of energy use (buildings, fleet and DUSWM) reduce non-renewable energy consumption by 50%, only that the total reduction for the County be 50%, however each Work Group adopted a 50% reduction as its target.

Buildings Work Group Findings

The Buildings Work Group was responsible for analyzing energy use in County buildings and parks and developing strategies to reduce non-renewable energy use by 50% over 15 years.

The Buildings Work Group analysis suggests that strategies based on the following main areas will meet the energy reduction goal:

- The application of high efficiency energy performance standards for new construction and renovation projects and the retrofitting of existing building heating, cooling, ventilation, lighting and control systems will improve efficiency and reduce the consumption of fossil fuels by up to 21%.

- On-site renewable energy installations utilizing geo-thermal, solar or wind energy could contribute up to a 4% conversion to renewable energy.

- Purchase of electricity with an increased percentage of renewable generation sources from the County's electricity vendor could achieve up to an overall 10% conversion to renewable energy. Once the waste-to-energy project is complete, the County will have the opportunity to purchase 100% of the County's electricity which will convert 64% of the buildings baseline to a renewable energy.

- Future technology advances that are currently in research and development are projected to achieve up to a 20% reduction of non-renewable energy use by 2024.

- Building consolidation of down-town office building locations could provide up to a 5% reduction in overall energy use.

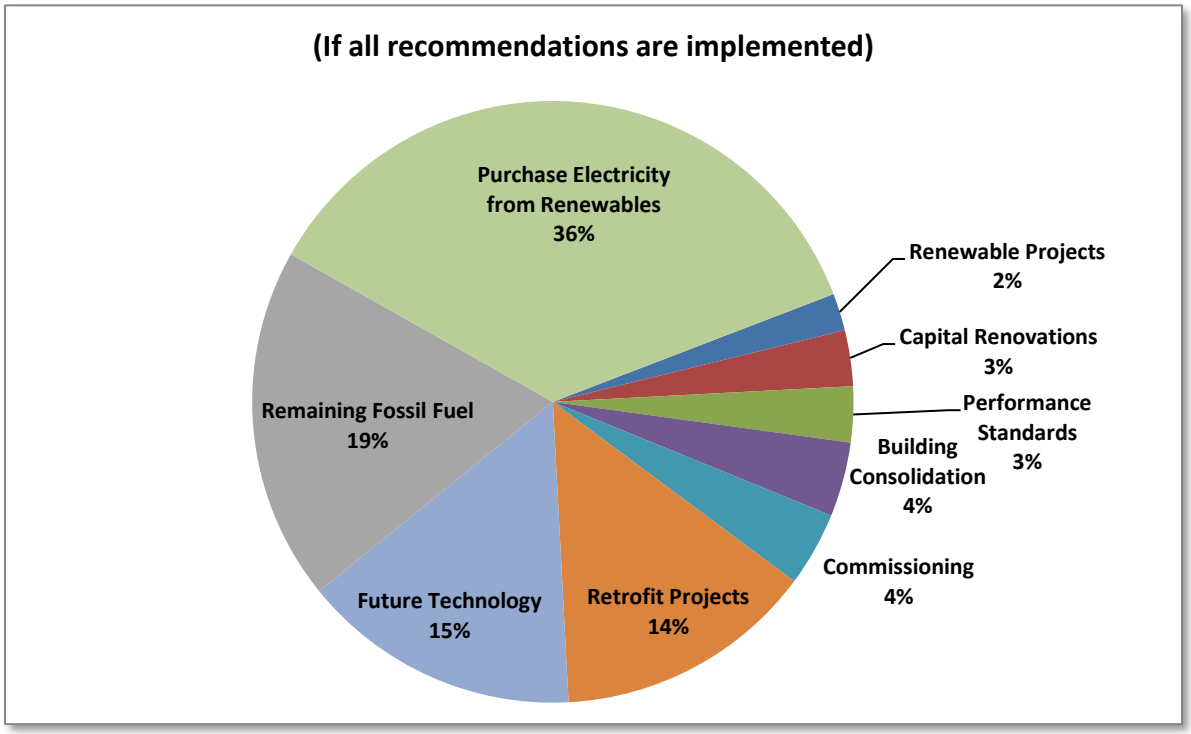
- Commissioning of existing County occupied buildings could result in up to a 5% reduction in energy use.

- Capital renovations such as HVAC upgrades and roof replacements could attain up to a 4% reduction in non-renewable energy.

Cumulative Effect

Shown in the figure below is the breakdown of the cumulative effect of each main strategy on reaching the reduction goal.

Non-Renewable Energy Reduction of Building-Related Energy Usage by 2024



Buildings Work Group Conclusion:

If all of the Buildings Work Group recommendations are implemented the cumulative effect will be a reduction of 81% in building-related consumption of non-renewable energy. Approximately 50% of the reduction would be achieved through conservation and 50% through conversion to renewable energy sources by 2024.

Fleet Work Group Findings

The Fleet Work Group was responsible for analyzing fuel use in the County vehicle and equipment fleet and developing recommendations to reduce non-renewable fuel use.

The overall findings of the Fleet Work Group are that the following programs will achieve a 50% reduction of non-renewable fuel use by 2024:

- Implementing the fuel conservation plan and down-sizing of fleet vehicles will reduce the amount of fossil fuel consumed by up to 19%.

- Conversion to bio-diesel blends will achieve up to a 12% conversion to a renewable energy.

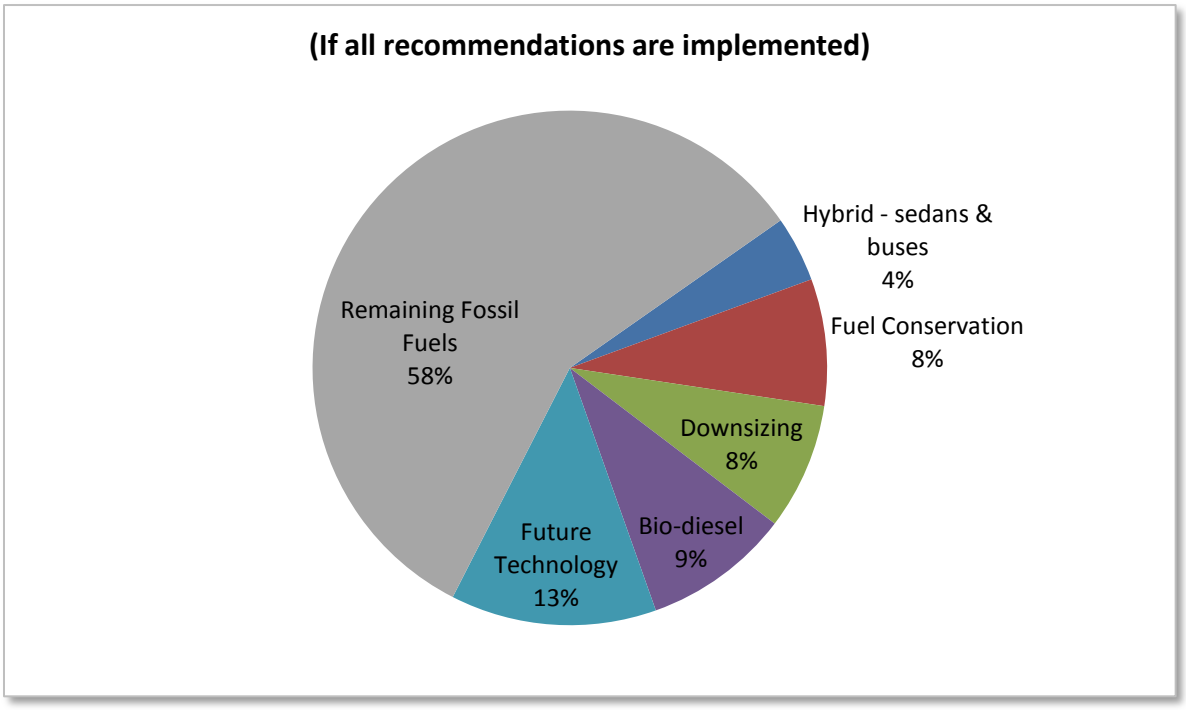
- Continued conversion to hybrid vehicle technology in the general vehicle fleet (sedans, SUVs, trucks) and transit buses will achieve up to a 6% conversion to a renewable energy.

- Technology advances that are in research and development could achieve up to a 15% reduction in non-renewable fuel use. This could include electric vehicle technology, expanded use of hybrid technology for trucks, advances in engine technology, and hydrogen-based fuel cell technology.

Cumulative Effect

Shown in the figure below is the breakdown of the cumulative effect of each main strategy on reaching the reduction goal.

Non-Renewable Energy Reduction of Fleet-Related Energy Usage by 2024



Fleet Work Group Conclusion:

If all of the Fleet Work Group recommendations are implemented the cumulative effect will be a reduction of 42% in fleet-related consumption of non-renewable energy. Approximately 55% of the reduction would be achieved through conservation and 45% through conversion to renewable energy sources by 2024.

Utilities and Solid Waste Facilities Findings

The Division of Utilities and Solid Waste have two projects underway that will produce electricity from renewable energy sources:

- Landfill gas recovery and electricity generation
- Municipal waste-to-energy plant

In addition to these projects the DUSWM has investigated the construction of a solar panel electricity generating facility at the County's closed landfill (Site A). Although a previous procurement for this project was unsuccessful, the DUSWM believes that such a project may be viable in the future as the capacity of the landfill gas to electricity (LFGE) projects naturally decreases, freeing up interconnection capacity, for electricity generation through an array of photovoltaic cells.

The two DUSWM projects underway have the potential to generate more electricity from renewable sources than the County's projected electricity requirements for 2024. DUSWM's projects have the potential to make the following contributions to the County's non-renewable energy reduction goal:

Landfill Gas to Electricity Project

The landfill gas recovery and electricity generation project will initially generate 2 megawatts of electricity beginning in August 2010. Landfill gas and electrical generation projections indicate that by 2021 the available LFG will only be able to provide a maximum of 1.5 MW of electricity. By 2026 electrical generation from the gas will drop to approximately 1 MW. By 2030 the available gas may be less than that required to power one of the two 1 MW engine generators continuously. Therefore this particular source of renewable energy has an estimated maximum 20 year life span and during that time period its generation capacity will be diminishing each year.

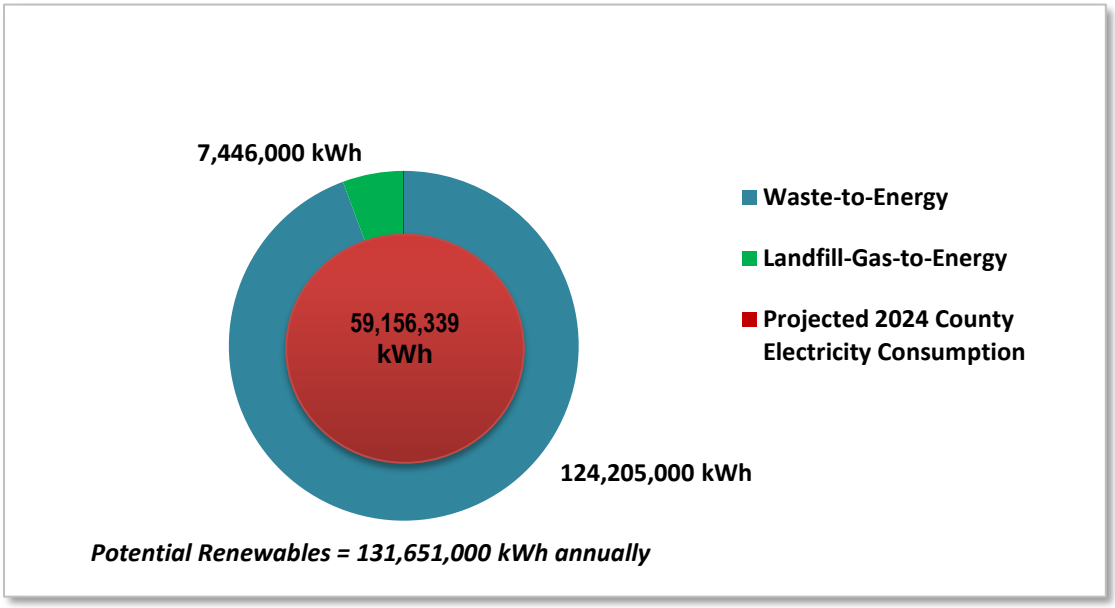
Frederick and Carroll County Waste-to-Energy Project

The Frederick and Carroll County municipal waste-to-energy project can provide up to 45 megawatts (net) of renewable electricity energy starting in 2015. Frederick County's share of that generation capacity is 27 MW, which results in a maximum annual generation of 217,598,400 kWh year, which is more than five times the County's calculated baseline electric consumption.[1] Adjusting this generation value based on only counting the biogenic portion of the waste as renewable energy, yields between 124,000,000 and 136,000,000 kWh per year, which is more than three times the County's baseline electric consumption and more than two times the County's projected 2024 electric energy consumption.

The figure below shows the projected electricity production from the landfill gas and the waste-to-energy projects compared to the County's total baseline electricity usage:

[1] Based on WTE contract 92% facility availability guarantee.

Utilities and Solid Waste – Renewable Energy (Electricity) Contribution Projection by 2024



Projections of costs and savings

A preliminary estimate of one-time costs, ongoing costs and ongoing savings based on implementation of the recommendations is provided in a chart titled "Annual Projected Costs and On-going Savings" in Appendix K. It is important to acknowledge that 15-year projections such as this are done without the benefit of a crystal ball and not all capital costs are known at this time. The further out projections go, the less reliable they are. However, this chart does provide a general order of magnitude to investment and savings that are possible with the implementation of this Plan.

SUMMARY OF RECOMMENDATIONS

1.0 Organizational Commitment

- ***Recommendation 1.1***: Obtain and demonstrate support and commitment from the County Commissioners and all management levels for energy conservation and the energy reduction goal of the County Commissioner's Strategic Plan.
  (Lead Agency = Office of Environmental Sustainability)

- ***Recommendation 1.2***: Conduct staff education on the importance of energy conservation to the goals of the County government and on techniques for conserving energy in the work place.
  (Lead Agency = Office of Environmental Sustainability)

- ***Recommendation 1.3***: Adopt written energy conservation expectations for County employees.
  (Lead Agency = Office of Environmental Sustainability)

- ***Recommendation 1.4***: Provide an annual report on the progress of the Comprehensive Energy Plan recommendations.
  (Lead Agency = Management Services Division)

2.0 Buildings

- ***Recommendation 2.1***: Adopt an Energy Management Program based on uniform operations, maintenance, and design standards.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.2***: Conduct energy audits of all major County buildings.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.3***: Make steady advances in energy conservation and energy efficiency in County buildings by implementing recommendations from building energy audits.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.4***: Install a centralized Energy Management Control System for County buildings.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.5***: Continue to use the EPA's ENERGY STAR Portfolio Manager software to analyze energy consumption, costs, and overall performance of County buildings to identify and prioritize energy conservation and efficiency projects.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.6***: Continue the County's capital program of building renovations that include HVAC upgrades to improve performance and energy efficiency.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.7***: Adopt high performance energy efficiency standards for new buildings and major renovation projects starting in FY2011.
  (Lead Agency = Office of Environmental Sustainability)

- ***Recommendation 2.8***: Use on-site renewable energy for County buildings when technically and financially feasible.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.9***: Purchase either renewable energy certificates or direct purchase electricity generated from renewable sources for 15% of the County's electricity requirements starting in 2013. Purchase additional renewable electricity when the waste-to-energy facility comes online.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.10***: Implement the "Technology Energy Management Plan" developed by the Interagency Information Technology Division.
  (Lead Agency = Interagency Information Technology Division)

- ***Recommendation 2.11***: Convert existing traffic lights to light-emitting diode (LED) technology by 2012 and use LED technology in all future installations.
  (Lead Agency = Division of Public Works)

- ***Recommendation 2.12***: Establish guidelines for County leased space to meet the energy efficiency standards for County-owned buildings.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.13***: Adopt policies to regulate the number of personal appliances in County buildings and require that new appliances, electronics and office equipment meet or exceed ENERGY STAR certification requirements.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.14***: Use roofing materials that minimize heat absorption in new construction and roof replacement projects.
  (Lead Agency = Management Services Division)

- ***Recommendation 2.15***: Use a third party commissioning agent for all new construction and renovation projects to verify energy-related systems (HVAC and electrical) are designed, installed and calibrated to perform as intended and achieve

maximum energy efficiency. Perform retro-commissioning of existing buildings on a systematic basis.
(Lead Agency = Management Services Division)

- ***Recommendation 2.16***: Consolidate general government offices into a single high-energy-efficiency building.
(Lead Agency = Management Services Division)

- ***Recommendation 2.17***: Utilize future energy-related technology advances as they become available to reduce the County's use of non-renewable energy.
(Lead Agency = Management Services Division)

3.0 Fleet

- ***Recommendation 3.1***: Continue active fuel conservation by all Divisions under the 2008 10 Percent Fuel Conservation Plan.
(Lead Agency = Fuel Conservation Committee)

- ***Recommendation 3.2***: Convert diesel fuel to a 20 percent bio-diesel blend (B20) in the summer months and a 5 percent bio-diesel blend (B5) in the winter months beginning summer 2011. As diesel engine technology improves and new vehicles are purchased the goal is to operate year round using a 20 percent bio-diesel blend.
(Lead Agency = Management Services Division)

- ***Recommendation 3.3***: Purchase hybrid gasoline/electric sedans and light trucks when possible as vehicles are replaced as a conversion to a renewable energy source.
(Lead Agency = Management Services Division)

- ***Recommendation 3.4***: Purchase hybrid transit buses whenever 90 percent federal funding is available for such purchases.
(Lead Agency = Transit Division)

- ***Recommendation 3.5***: Down-size vehicles to the most fuel-efficient vehicles that can perform the job. Focus purchase decisions on right-sizing vehicles to meet the user's job requirements rather than user preferences.
(Lead Agency = Management Services Division)

- ***Recommendation 3.6***: Utilize teleconferencing and webinar capabilities in County facilities to reduce staff travel to meetings.
(Lead Agency = Office of Environmental Sustainability)

- ***Recommendation 3.7***: Investigate vehicle and fuel technology advancements annually to determine if they would benefit County operations and the reduction of non-renewable fuel consumption.
  (Lead Agency = Management Services Division)

4.0 Utilities and Solid Waste Facilities

- ***Recommendation 4.1***: Continue the landfill gas recovery and electricity generation project which can produce up to 2 megawatts of renewable electricity.
  (Lead Agency = Division of Utilities and Solid Waste Management)

- ***Recommendation 4.2***: Pursue construction of a regional municipal waste-to-energy project that can provide 45 megawatts of renewable electricity beginning in 2015.
  (Lead Agency = Division of Utilities and Solid Waste Management)

- ***Recommendation 4.3***: Re-evaluate the option for the installation of a photovoltaic solar technology project in five years.
  (Lead Agency = Division of Utilities and Solid Waste Management)